

THE INVENTION CLAIMED IS:

1. In a bicycle having a crank tube with right and left ends, a two-piece crank hanger set comprising:

a left crank arm having axial and distal ends, a tubular crank spindle having left and right ends and inner and outer surfaces, said tubular crank spindle being attached at its left end to the axial end of said left crank arm, said inner surface of the right end of said tubular crank spindle being threaded;

a right crank arm having an axial and distal end, at least one chain sprocket wheel attached to the axial end of said right crank arm, said chain sprocket wheel having an axial opening extending therethrough that is in alignment with an opening extending through the axial end of said right crank arm;

a left bearing retainer press fit onto said tubular crank spindle and substantially into abutment with said left crank arm, said left bearing retainer having a circumferential race retaining a plurality of tapered roller bearings;

a left bearing cup removably attached to the left end of said crank tube, said left bearing cup having a tapered bearing contact surface abutting said tapered roller bearings of said left bearing retainer;

a right bearing cup removably attached to the right end of said crank tube, said right bearing cup having a tapered bearing contact surface;

a tubular stop member having inner and outer surfaces and right and left ends, said tubular stop member being positioned on the outer end of said tubular crank spindle and held in place by a spline mechanism;

a right bearing retainer press fit onto said tubular stop member, said right bearing retainer having a circumferential race retaining a plurality of tapered roller bearings, said tapered roller bearings being in abutment with said bearing contact surface of said right bearing cup; and

a preload and attachment bolt passing through the opening in the axial end of said right crank arm, through the axial opening in said chain sprocket wheel, and into threaded engagement with said threaded inner surface of the outer end of said tubular crank spindle, said preload and attachment bolt adapted to be tightened to preload said bearings.

2. The apparatus of claim 1 wherein said spline mechanism is comprised of at least one longitudinally extending key or groove located on the outer surface of the right end of said tubular crank spindle, and at least one longitudinally extending and mating groove or key located on the inner surface of said tubular stop member.

3. The apparatus of claim 1 wherein said spline mechanism is comprised of a plurality of longitudinally extending keys or grooves located around the outer surface of the right end of said tubular crank spindle, and a plurality of longitudinally extending grooves or keys located around the inner surface of said tubular stop member, said keys or grooves of said tubular crank spindle being adapted to mate with said grooves or keys of said tubular stop member.

4. The apparatus of claim 1 wherein said preload and attachment bolt is an assembly including an external sleeve, a coil spring, and an internal sleeve;

said external sleeve having an external sleeve body that is a hollow cylinder having an inner end and an outer end, said external sleeve body having internal and external cylindrical surfaces having internal and external helical threads located thereon, respectively, at least two expansion slots located in the inner end of said external sleeve body, said inner end of said external sleeve body having a thickened internal taper, an external sleeve flange located on the outer end of said external sleeve body, and a spring stop member located within said external sleeve flange;

said internal sleeve having an internal sleeve body that is a hollow cylinder having an inner end and an outer end, said internal sleeve body having an external cylindrical surface having external threads located thereon, and an internal sleeve flange located on the outer end of said internal sleeve body;

said coil spring having an inner and outer end, said coil spring being positioned around said internal sleeve body, said inner end of said coil spring being in abutment with said spring stop member of said external sleeve, and said outer end of said coil spring being in abutment with said internal sleeve flange;

said internal sleeve body being screwed into said external sleeve body a distance that causes the inner end of said internal sleeve body to engage said thickened internal taper of said external sleeve body and to cause said inner end of said external sleeve body to expand.

5. The apparatus of claim 4 wherein said external sleeve body and said internal sleeve body each have a longitudinal axis, and said internal threads of said external sleeve body and said external threads of said internal sleeve body are oriented at a mating angle of between about 40 degrees and about 50 degrees to the longitudinal axis of their respective sleeve bodies.

6. The apparatus of claim 5 wherein said mating angle is about 45 degrees.

7. The apparatus of claim 4 wherein said internal threads of said external sleeve body and said external threads of said internal sleeve body are coarse.

8. A two-piece crank hanger set for assembly onto the crank tube of a bicycle comprising:

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a left crank arm having an axial and distal end, a tubular crank spindle having left and right ends and inner and outer surfaces, said tubular crank spindle being attached at its left end to the axial end of said left crank arm, said inner surface of the right end of said tubular crank spindle being threaded;

a right crank arm having an axial and distal end, at least one chain sprocket wheel attached to the axial end of said right crank arm, said chain sprocket wheel having an axial opening extending therethrough that is in alignment with an opening extending through the axial end of said right crank arm;

a left bearing retainer adapted to be press fit onto said tubular crank spindle

and substantially into abutment with said left crank arm, said left bearing retainer having a circumferential race retaining a plurality of tapered roller bearings;

    a left bearing cup adapted to be removably attached to the left end of the crank tube of a bicycle, said left bearing cup having a tapered bearing contact surface adapted to abut said tapered roller bearings of said left bearing retainer;

    a right bearing cup adapted to be removably attached to the right end of said crank tube of said bicycle, said right bearing cup having a tapered bearing contact surface adapted to abut said tapered roller bearings of said right bearing retainer;

    a tubular stop member having inner and outer surfaces and right and left ends, said tubular stop member adapted to be positioned onto the outer end of said tubular crank spindle and held in place by a spline mechanism;

    a right bearing retainer adapted to be press fit onto said tubular stop member, said right bearing retainer having a circumferential race retaining a plurality of tapered roller bearings; and

    a preload and attachment bolt having external threads thereon and adapted to pass through the opening in the axial end of said right crank arm, through the axial opening in said chain sprocket wheel, and into threadable engagement with said threaded inner surface of the outer end of said tubular crank spindle, said preload and attachment bolt adapted to be tightened to preload said bearings when said two-piece crank hanger set has been assembled onto said crank tube of said bicycle.

9. The apparatus of claim 8 wherein said preload and attachment bolt is an assembly including an external sleeve, a coil spring, and an internal sleeve;

said external sleeve having an external sleeve body that is a hollow cylinder having an inner end and an outer end, said external sleeve body having internal and external cylindrical surfaces having internal and external helical threads located thereon, respectively, said external threads adapted to threadably mate with said threaded inner surface of the outer end of said tubular crank spindle, at least two expansion slots located in the inner end of said external sleeve body, said inner end of said external sleeve body having a thickened taper, an external sleeve flange located on the outer end of said external sleeve body, and a spring stop member located within said external sleeve flange;

said internal sleeve having an internal sleeve body that is a hollow cylinder having an inner end and an outer end, said internal sleeve body having an external cylindrical surface having external threads located thereon, and an internal sleeve flange located on the outer end of said internal sleeve body;

said coil spring having an inner and outer end, said coil spring adapted to being positioned around said internal sleeve body with said inner end of said coil spring being in abutment with said spring stop member of said external sleeve and said outer end of said coil spring being in abutment with said internal sleeve flange;

said internal sleeve body adapted to be screwed into said external sleeve body a distance that causes the inner end of said internal sleeve body to engage said thickened internal taper of said external sleeve body and to cause said inner end of said external sleeve body to expand.

10. The apparatus of claim 9 wherein said coil spring has a compression resistance that prevents said internal sleeve from being screwed into said external sleeve until a prescribed torque load had been placed upon said bearings.

11. The apparatus of claim 10 wherein said external sleeve body and said internal sleeve body each have a longitudinal axis, and said internal threads of said external sleeve body and said external threads of said internal sleeve body are oriented at a mating angle of between about 40 degrees and about 50 degrees to the longitudinal axis of their respective sleeve bodies.

12. The apparatus of claim 11 wherein said mating angle is about 45 degrees.

13. The apparatus of claim 11 wherein said internal threads of said external sleeve body and said external threads of said internal sleeve body are coarse.

14. A preload and attachment bolt assembly comprising an external sleeve, a coil spring, and an internal sleeve;

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said external sleeve having an external sleeve body that is a hollow cylinder having an inner end and an outer end, said external sleeve body having internal and external cylindrical surfaces having internal and external helical threads located thereon, respectively, said external threads adapted to threadably engage an attachment member, at least two expansion slots located in the inner end of said external sleeve body, said inner end of said

external sleeve body having a thickened internal taper, an external sleeve flange located on the outer end of said external sleeve body, and a spring stop member located within said external sleeve flange;

    said internal sleeve having an internal sleeve body that is a hollow cylinder having an inner end and an outer end, said internal sleeve body having an external cylindrical surface having external helical threads located thereon adapted to mate with said internal helical threads of said external sleeve body, and an internal sleeve flange located on the outer end of said internal sleeve body;

    said coil spring having an inner and outer end, said coil spring adapted to being positioned around said internal sleeve body with said inner end of said coil spring being in abutment with said spring stop member of said external sleeve and said outer end of said coil spring being in abutment with said internal sleeve flange;

    said internal sleeve body adapted to be completely screwed into said external sleeve body to thereby cause the inner end of said internal sleeve body to engage said thickened internal taper of said external sleeve body and to cause said inner end of said external sleeve body to expand.

15. The apparatus of claim 14 wherein said coil spring has a compression resistance that prevents said internal sleeve from being completely screwed into said external sleeve until a prescribed torque load had been placed upon said attachment member.

16. The apparatus of claim 15 wherein said external sleeve body and said internal sleeve body each have a longitudinal axis, and said internal threads of said external sleeve body and said external threads of said internal sleeve body are oriented at a mating angle of between about 40 degrees and about 50 degrees to the longitudinal axis of their respective sleeve bodies.

17. The apparatus of claim 16 wherein said mating angle is about 45 degrees.

18. The apparatus of claim 16 wherein said internal threads of said external sleeve body and said external threads of said internal sleeve body are coarse.